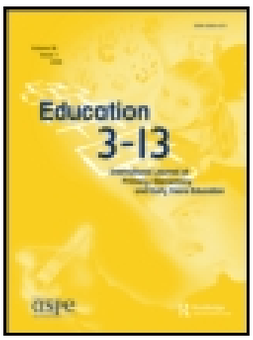

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Complementing the Australian primary school Health and Physical Education (HPE) curriculum: exploring children's HPE learning experiences within varying school ground equipment contexts

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ABSTRACT

This paper unearths how primary school children experience and can complement the Australian HPE curriculum within three unique school ground equipment scenarios that include an 'empty', 'loose parts' and a 'traditional' school ground context. Using direct observation, 490 scans were undertaken of the school grounds over five days. Field note observations recorded children's HPE learning experiences according to the curriculum, and predominant physical activity types and intensities were recorded. Implementing a variety of school ground equipment provisions was revealed to be important compared to the 'empty' school ground context for primary school children to meet HPE curriculum objectives.

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Primary school; curriculum; Health and Physical Education (HPE); school grounds; physical activity; equipment

Background

Schools are 'an institution or building at which children and young people usually under 19 receive education' (Oxford Dictionaries, 2014) and provide an important setting to develop children's physical activity skills to ensure that children are equipped for life to prevent the onset of 'inactivity inducing' future diseases (Kriemler et al. 2011). Children from a number of countries are failing to meet the recommended guidelines for physical activity participation via active classes (e.g. physical education) (Trost and Van Der Mars 2009), emphasising the importance of settings to complement the Health and Physical Education (HPE) curriculum such as from informal opportunities within school grounds (Hyndman et al. 2012; Hyndman and Telford 2015). A growing body of research continues to suggest that schools need to consider strategies beyond structured classroom agendas within school grounds to ensure that children have complementary opportunities to meet national physical activity objectives (Dobbins et al. 2013). In many schools, children have the opportunity to participate in hundreds of recess break opportunities within school grounds each year (e.g. morning recess, afternoon recess; Stratton 2000) and such activities supply substantial opportunities for children to engage in physical developmental opportunities (Bundy et al. 2009; Engelen et al. 2013; Hyndman, Benson, and Telford 2014). As children's time allocation at school can surpass 30 hours per week (Dobbins et al. 2013), it is imperative that further awareness is developed of the benefits of children engaging in HPE curriculum opportunities beyond scheduled classes (Hyndman et al. 2012).

The Australian HPE curriculum is important to provide continued, developmentally appropriate and explicit learning relating to health and movement for children (ACARA 2014). The Australian HPE curriculum provides a basis so that children experience creating, applying, practicing, understanding and evaluating skills within the HPE discipline (ACARA 2014). Yet, the scope of the school

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grounds context to educate HPE and other subjects beyond formal classroom agendas is just beginning to be understood (Hyndman et al. 2012). As educators (e.g. teachers, teacher educators/academics, pre-service teachers, principals) are often the gate-keepers when developing school ground policies, planning and implementation in schools (Hyndman et al. 2012), teachers (especially HPE) can play a key role in developing school grounds that facilitate children meeting HPE curriculum objectives (Hyndman et al. 2012; Hyndman and Telford 2015). To date, there has been an absence of scholarly work exploring how the Australian primary school HPE curriculum can be met from different school ground equipment contexts. Furthermore, no research study we are aware of has examined how children can meet HPE curriculum objectives when school grounds are 'empty' of almost all types of equipment.

Despite the potential of school grounds to help children meet HPE curriculum objectives, many school grounds in Australia are over 50 years old (Chancellor 2013). Research has also revealed that despite teachers being scheduled to undertake school ground supervision (Chancellor 2013) on a daily basis, teachers frequently report that supervision of school grounds (e.g. yard duty) is a duty they wish to forego (Chancellor 2008). During burdensome weeks of classroom teaching, daily allocation of school ground supervision is often seen as stressful to already busy educators (Chancellor 2008). With many activities within this setting being complementary and transferable from the national HPE curriculum, it is imperative that greater insight is provided into how school ground settings can be used by children to develop crucial HPE skills.

Whilst well-designed primary school grounds can develop children's cognitive, social and physical skills (Hyndman et al. 2014), research has revealed that many Australian primary schools have eliminated play spaces and equipment, have overcrowded spaces and implement restrictive school ground rules, resulting in reduced capacity for children to be physically active (Chancellor 2013). A number of school ground strategies have been introduced by researchers including recess activity facilitating teachers (Sallis et al. 2003), weekly physical activity themes (Stellino et al. 2010), provision of sports equipment and activity instructions (Verstraete et al. 2006), fitness focuses (Scruggs, Beveridge, and Watson 2003), surface markings (Stratton 2000), school greening (Dyment, Bell, and Lucas 2009) and fixed equipment structures (Ridgers et al. 2007) to facilitate children's physical activity. Despite many of these strategies resulting in improved participation levels, there is a growing need to examine the influence on HPE learning and how physical skills can be learnt informally within school grounds to complement the formal HPE curriculum (Hyndman et al. 2012; Hyndman, Benson, and Telford 2014; Hyndman and Chancellor 2015). Having a philosophical commitment to the value of school grounds for developing children's health and physical activity values (Malone and Tranter 2003; Malone 2007) beyond formal classroom agendas is an important consideration.

Therefore, the aim of this paper is to unearth how primary school children experience and can complement the Australian HPE curriculum within three unique school ground equipment scenarios that include an 'empty' school ground context, 'loose parts' school ground context and a 'traditional' school ground context. A secondary aim is to explore how each school ground equipment context can impact on children's predominant physical activity types and intensities across five consecutive lunchtime recess periods.

Methods

School selection

A newly formed catholic co-educational primary school that contained no fixed equipment on their school grounds was approached to participate as the 'empty' school grounds equipment context and 'loose parts' school ground equipment context. A primary school that had a 'fixed, traditional school ground' context with otherwise similar characteristics such as school type (prep to year 6; 5–12-year-olds, co-education, socio-economic status, school ground size, sector and enrolments) was selected and recruited to participate in the school grounds study via email invitation, phone

correspondence and schools visits to the Principal. Both primary schools were situated in the Regional Western Victoria geographic region in Australia. All children in the study participated in their normal, daily school routines.

Participants and recruitment

All primary school children (5–12-years-old) were provided with an information statement outlining the research, along with a parental and participant consent form. A total of 123 children participated in physical activities within the 'empty' and 'loose parts' school ground context school (mean 7.0 years ± 1.9; 90% response rate) and 152 children from the 'traditional' school ground context (mean 8.2 years ± 2.1; 86% response rate) returned approved the parental consent forms to participate in the school grounds study HPE curriculum study. For those in which parental and/or participant consent was not received, school leaders provided spaces away from the school ground spaces for the children to play (e.g. indoors) during the five days of measurement. Measurements were conducted in March and April during term one early in the school year.

The school ground contexts

'Empty' school ground equipment context

This school ground context was defined as 'empty' as this was a brand new primary school campus (Figure 1). The children did not have access to traditional equipment (e.g. climbing structures, slides, surface markings) and only had access to three plastic sandpits and a soccer ball across an entire grass field. The uniquely 'empty' school ground context consisted of a grass field that had a steep incline and was a triangular shape. There was also a hard-surfaced car park area next to the grass field. Children were allowed on the school grounds for 30 minutes at morning recess and 30 minutes during lunchtime recess.

'Loose parts' school ground equipment context

After seven weeks of loose parts equipment being introduced with no fixed purpose on to the grass field of the 'empty' school ground context in the brand new Catholic primary school, the 'loose parts' school ground equipment context was measured (Figure 2). The loose parts equipment that were introduced to create this new school ground equipment context included equipment generally not considered as traditional items for children within schools (e.g. different to monkey bars, slides), with the exception of hoops, play balls and skipping ropes. The loose parts included buckets, tyre tubes, cardboard boxes, milk crates, swimming noodles, pipes, plastic walls and

Figure 1. The 'empty' school ground equipment context.

sheets, vacuum/pool hoses, hessian bags, water/sand shells, tractor/motorbike and bicycle tyres, buckets, swimming boards, exercise mats and hay bales. There was no traditional, fixed equipment in the school grounds (e.g. monkey bars, slides, climbing equipment).

'Traditional' school ground equipment context

The 'traditional' school ground equipment context (Figure 3) shares many of the features revealed by Chancellor (2013) that are present within Australian school grounds such as sets of fixed playground equipment (monkey bars, slides), sports facilities (oval, basketball courts, soccer and football goals) and surface markings. Specifically, this school ground context contained hard-surfaced area alongside the school classroom structures at the entrance of the primary school with surface markings (for hopscotch-type activities), three sets of fixed equipment spaces that included monkey bars, ladders, wooden bridges, climbing frames and slides. The sports oval consisted of a set of football (soccer) goal posts and Australian football goal posts which was bordered by tall trees, a 'fixed' spider web structure and a large sandpit. Beyond the sports oval was a basketball court area. The students within the traditional, fixed equipment school ground context had a morning recess period lasting 15 minutes and a lunchtime recess period of 45 minutes.

Outcome measures

The first outcomes variable of this mixed-methods study utilised the System of Observing Play and Leisure Activities in Youth (SOPLAY), an area-level direct observation instrument designed to collect quantitative contextual information on students' physical activity within school grounds (McKenzie et al. 2000). The second measurement approach included detailed field note observations that were used to record and collect details of all physical activities developed and participated in within each school ground equipment context according to the Australian HPE primary school curriculum.

Direct observation: SOPLAY

The physical activity types and intensities of primary school children within the three school ground equipment contexts were measured using the SOPLAY (McKenzie et al. 2000). Assessor training included familiarising the SOPLAY instruction manual, coding and observation practice being applied to recess video samples. Video recordings of lunchtime recess were undertaken across five days at each school ground context. Using video for direct observation has been revealed to develop the instrument reliability during measurement and ensured that further school ground scans (5× scans over 30 minutes: empty/loose parts context; 8× scans over 45 minutes: traditional

Figure 2. The 'loose parts' school ground equipment context.

Figure 3. The 'traditional' school ground equipment context.

equipment context) could be undertaken to increase the sensitivity of the instrument during lunchtime recess. The school ground measurement areas were determined prior to the SOPLAY measurements by identifying the areas in which all students' physical activities could be captured (McKenzie et al. 2000). Indoor physical activity measurements were not conducted within the study.

To assist with the SOPLAY coding, the researchers commented on the video. Each of the videos of the school grounds were converted to computers using the iMovie 2011™ software and stored. After conversion, the school ground video was measured for physical activity intensities and types using the SOPLAY instrument. For sun protection purposes, both of the primary schools within the study had a policy of 'No Hat, No Play' which meant gender-specific identification from all recording was not possible. No identifiable activity is defined as a predominant activity during the SOPLAY observation scans when the majority of children were engaged in sitting, standing and walking activity (McKenzie 2002). Details of some of the less prominent and sporadic types of activities that were occasionally demonstrated by children when no identifiable activity was coded as the predominant activity are detailed within the field notes section.

Field note observations

Descriptive qualitative accounts within each of the school ground equipment contexts during the process of collecting and coding the data were documented via field note observations (Morse 1994; Bogdan and Biklen 1997). The field note observations were used to complement SOPLAY instrument coding by documenting the physical activities the students developed and engaged in, saw, experienced, heard and thought of within each of the school ground contexts (Morse 1994; Bogdan and Biklen 1997). The field note observations were undertaken by five education academics with an average of 20 years teaching experience to ensure that all types of physical activities the primary school students engaged in were recorded and categorised according to each of the Australian HPE curricular standards and sub-standards (ACARA 2014). These include:

Personal, social and community health strand (ACARA 2014)

Sub-strands:

(1) Being healthy, safe and active: Focuses health decisions, supporting resilience, accessing health information, personal identifies and contextual factors;
(2) Communicating and interacting for health and well-being: Critically engaging in health focus areas and applying knowledge to evolving health circumstances;

(3) Contributing to healthy and active communities: Enable students to critically analyse health contextual such as products, services and environments.

Movement and physical activity strand (ACARA 2014)

Sub-strands:

(1) Moving our body: Laying the foundations of play and fundamental movement skills;
(2) Understanding movement: Ensuring that students understand the processes of a moving body and exploration of such processes;
(3) Learning through movement: The intra- and inter-personal skills that are developed during physical activity participation that include solving problems, making decisions, thinking critically, communicating and cooperation with others.

Data analysis

The Statistical Package for Social Sciences (SPSS) version 22 was used to analyse the SOPLAY direct observation data. A Chi-square statistical test was used to compare the direct observation proportions in each physical activity intensity and activity type between the 'empty' of equipment, 'loose parts' equipment and 'traditional' equipment and scenarios (significance set at the $p < .05$ level). The analysis of the field note observations was based upon the strands and sub-strands of the foundation to level six (primary year six) Australian HPE curriculum to identify emerging similarities and differences within and between the three school ground equipment contexts. The information provided from the field note observations were used to determine the types of physical activities developed and engaged with that can complement the Australian HPE curriculum. As the physical activities of the primary school children in the study were less of a specific match with HPE curriculum sub-strand one (Being healthy, safe and active), this sub-strand was not reported in the findings.

Results

Direct observation

Predominant physical activity types within each school ground equipment context

From the 490 SOPLAY direct observation area scans across each of the five days, the predominant activities within the three school ground equipment contexts were revealed.

'Empty' school ground context. The findings report that the most predominant overall physical activity within the 'empty' school ground equipment context was 'no identifiable activity' (ranging from 20% to 80% of scans on days 2–5), 'soccer' (ranging from 20% to 40% of scans on days 1–4) and 'sandpit play' (ranging from 4% to 20% of scans on days 1–4; Table 1).

'Loose parts' school ground context. Within the 'loose parts' equipment context, the predominant activities were 'imaginative play with loose parts' (ranging from 38% to 64% of scans across all days), 'building and construction with loose parts' (ranging from 8% to 31% of scans during days 2, 3 and 5) and 'soccer' (ranging from 4% to 20% of scans across all days; Table 1).

'Traditional' school ground context. From the overall objective assessment of the 'traditional' school ground equipment context, the most predominant activities included 'no identifiable activity' (ranging from 16.3% to 37.5% of scans across all days), 'imaginative play with fixed equipment' (ranging from 16.7% to 33.3% of scans across all days) and 'downball' (ranging from 2.1% to 10.4% of scans cross all days; Table 1). As these were the predominant scanned activity types

Table 1. Objectively measured physical activity types between each school ground equipment context over five lunchtime recess periods.

Direct observation (Activity type)	'Empty' school ground equipment context					'Traditional' school ground equipment context					'Loose parts' school ground equipment context				
	L1	L2	L3	L4	L5	L1	L2	L3	L4	L5	L1	L2	L3	L4	L5
Australian Rules Football (%)	–	–	–	–	–	1 (2.1)	–	–	5 (10.2)	6 (12.5)	5 (20.0)	1 (4.0)	4 (16.0)	–	1 (3.4)
Baseball/softball (%)	–	–	–	–	–	-	3 (6.3)	–	–	–	–	–	–	–	-
Basketball	–	–	–	–	–	1 (2.1)	7 (14.6)	3 (6.3)	–	–	–	–	–	–	–
Cricket (%)	3 (12.0)	2 (8.0)	–	–	–	3 (6.3)	–	–	–	–	–	–	–	1 (4.0)	1 (3.4)
Downball (%)	–	–	–	–	–	8 (16.7)	7 (14.6)	8 (16.7)	12 (24.5)	1 (2.1)	–	–	–	–	–
Imaginative play (fixed equipment) (%)	–	–	–	–	–	8 (16.7)	14 (29.2)	19 (39.6)	12 (24.5)	16 (33.3)	–	–	–	–	–
Imaginative play (no equipment) (%)	–	–	2 (8.0)	-	5 (20.0)	5 (10.4)	3 (6.3)	1 (2.1)	1 (2.0)	3 (6.3)	–	2 (8.0)	1 (4.0)	4 (16.0)	–
Imaginative play (loose parts equipment) (%)	–	–	–	–	–	–	–	–	–	–	16 (64.0)	13 (54.0)	12 (48.0)	15 (60.0)	11 (37.9)
Building with loose parts equipment (%)	16 (64.0)	–	–	–	–	–	–	–	–	–	–	2 (8.0)	5 (20.0)	–	9 (31.0)
No identifiable activity (%)	–	11 (44.0)	5 (20.0)	8 (30.8)	20 (80.0)	18 (37.5)	14 (29.2)	14 (29.2)	8 (16.3)	16 (33.0)	-	3 (20.0)	2 (8.0)	-	4 (13.8)
Play with sports equipment (%)	–	–	–	–	–	4 (8.3)	–	–	–	–	–	–	–	–	–
Racquet sports (%)	–	–	5 (20.0)	5 (19.2)	–	–	–	–	–	–	–	–	–	–	–
Sandpit play (%)	1 (4.0)	2 (8.0)	5 (20.0)	4 (15.4)	–	–	–	–	2 (4.1)	–	–	–	–	–	–
Soccer (%)	5 (20.0)	10 (40.0)	8 (32.0)	9 (34.6)	–	–	–	3 (6.3)	9 (18.4)	6 (12.5)	4 (16.0)	3 (12.0)	1 (4.0)	5 (20.0)	3 (10.3)
Total lunchtime area scans (%)	25	25	25	25	25	48	48	48	48	48	25	25	25	25	25

Notes: L = Lunchtime recess; the 'empty' school ground equipment context and 'loose parts' school ground equipment context lunchtime period = 30 minutes recess time; the 'traditional' school ground equipment context lunchtime period = 45 minutes recess time; direct observation utilised SOPLAY (McKenzie et al. 2000); 125 direct observation scans were conducted within the 'empty' and 'loose parts' school ground equipment contexts; 240 direct observation scans were conducted within the 'traditional' school ground equipment context.

recorded via the SOPLAY observation instrument, details of all types of HPE learning experiences within each of the school ground equipment contexts are described in the field note observations aligned with the Australian primary school HPE curriculum.

Physical activity intensities

Across each of the five lunchtime recess periods, direct observation comparisons from the chi-square statistical test revealed that the average proportion of children coded as participating in sedentary behaviour (e.g. sitting/standing type activity) was significantly higher in both the 'empty' (days 1–4) and 'traditional' (days 1–3 and 5) school ground equipment contexts in comparison to the 'loose parts' equipment context (Table 2). Similarly, the average proportion of primary school children across the five lunchtime recess periods coded as participating in vigorous physical activity (e.g. running, sprinting, climbing vigorously) that were exposed to the 'loose parts' equipment context was significantly higher than those children experiencing the 'empty' (days 1–5) and 'traditional'(days 1–5) equipment contexts (Table 2).

Field note observations of children's developed physical activities to complement the Australian primary school HPE curriculum within each context

'Communicating and interacting for health and well-being' HPE curriculum sub-strand (e.g. interaction, inclusion skills, communication skills, outdoor games content)

'Empty' school ground context. The activities that were identified often included simplified group activities such as following a leader around the grass field, star jumps or jumping on the spot and attempting to copy other individuals' physical activities.

Table 2. Objectively measured physical activity intensities between each school ground equipment context over the five lunchtime recess periods.

		Percentage comparison of average children in each physical activity intensity across lunchtime recess direct observation scans		
Direct observation (Intensity)	Lunchtime	'Empty' school ground equipment context	'Traditional' school ground equipment context	'Loose Parts' school ground equipment context
Sedentary behaviour (%)	1	33.6 (64.8)	51.63 (65.6)	41.0 (49.2)
	2	36.5 (57.7)	55.58 (66.1)	30.0 (36.8)
	3	36.2 (75.1)	61.05 (60.0)	33.0 (46.2)
	4	56.0 (72.0)	52.25 (57.8)	33.8 (59.7)
	5	23.4 (38.6)	69.50 (59.7)	29.6 (41.9)
Average total of children per lunchtime in activity intensity (% of intensity total)		37.0 (61.5)	58.2 (61.5)	33.5 (43.6)[#]
Walking physical activity (%)	1	13.4 (25.9)	21.4 (27.3)	18.2 (21.8)
	2	19.2 (30.3)	20.5 (24.5)	29.2 (35.8)
	3	8.0 (16.6)	29.7 (29.2)	21.6 (30.3)
	4	17.8 (22.9)	29.3 (31.3)	18.8 (33.2)
	5	28.5 (14.5)	29.5 (25.5)	19.8 (28.1)
Average total of children per lunchtime in activity intensity (% of intensity total)		17.5 (28.8)	25.8 (27.5)	21.5 (28.1)
Vigorous physical activity (%)	1	4.9 (9.3)	5.9 (7.1)	24.2 (29.0)
	2	7.7 (12.0)	7.9 (9.4)	22.3 (27.5)
	3	4.0 (8.3)	11.3 (10.8)	16.7 (23.5)
	4	4.0 (5.1)	9.9 (10.9)	24.0 (42.4)
	5	8.8 (14.5)	17.9 (14.8)	21.2 (30.0)
Average total of children per lunchtime in activity intensity (% of intensity total)		6.0 (9.7)	10.2 (11.0)	21.5 (28.3)[#]

[#]Significant difference ($p < .01$) based on a Chi-square test for comparing proportions (%) of daily physical activity intensity between the school ground contexts; the 'empty' school ground equipment context and 'loose parts' school ground equipment context lunchtime period = 30 minutes recess time; the 'traditional' school ground equipment context school lunchtime period = 45 minutes recess time; direct observation utilised SOPLAY (McKenzie et al. 2000); 125 direct observation scans were conducted within the 'empty' and 'loose parts' school ground equipment contexts; 240 direct observation scans were conducted within the 'traditional' school ground equipment context.

'Loose parts' school ground context. The group communications and interactions were more complex with children working together to build, design and set up stations for physical activity, teamwork skills to create space, learning from other group physical activities via peer observation, demonstrating patience when waiting to undertake activities with desired equipment, recruitment of team members and the negotiation skills of exchanging loose parts equipment.

'Traditional' school ground context. Many of the physical activities conducted for this curriculum standard within the 'traditional' equipment context were of a similar nature to those within the 'loose parts' equipment context. Rather than planning activity stations with diverse equipment, the children would be planning activity sequences on monkey bars or where to explore in the school grounds, demonstrating patience and assisting others during monkey bar activities, following the leader (and teacher) group walking and running and instructing others on specific skills and movements.

'Moving our body' HPE curriculum sub-strand (e.g. fundamental movement skills, movement sequences, movement situations/concepts, practicing/applying skills)

'Empty' school ground context. Provided opportunities to engage in 'non-equipment' movements that included walking, jogging, skipping and jumping locomotor movements often around the perimeter of the grass field.

'Loose parts' school ground context. The convenient height of the milk crates and hay bales facilitated regular jumping and landing practice to the ground, over and on to equipment. The non-fixed nature of the equipment facilitated regular dragging of equipment to desired spaces, rolling/bouncing and hula hooping circular equipment items. Other notable movement sequences and skills demonstrated with the loose parts included hiding, swinging swimming noodles and sleighing with empty plastic sandpits.

'Traditional' school ground context. Similar to the 'loose parts' equipment context, the children would engage in regular jumping and landing up to monkey bars, over obstacles, surface markings and on the spot. Fundamental skills such as unstructured basketball dribbling practice and soccer kicking was also evident.

'Contributing to healthy and active communities' HPE curriculum sub-strand (e.g. engagement with outdoors/nature, exploration of natural/built environments)

For this curriculum strand, the children largely met the primary school HPE content at a prep (foundation) to grade one level:

'Empty' and 'loose parts' school ground context. Within both school ground contexts, the natural/outdoor/built setting in which the children engaged with during physical activities largely included sandpit activities, engaging in physical activities on the grass field and exploring the perimeter region of trees to the grass field.

'Traditional' school ground context. The extra presence of rocks and gardens within the 'traditional' school ground context provided other developed activities that included climbing and hopping over rocks and using garden barriers as balancing beams.

'Understanding movement' HPE curriculum sub-strand (e.g. movement in relation to space, objects, people and manipulating/modifying movement sequences)

'Empty' school ground context. The children would undertake spin movements, pretend movements/gestures (e.g. throwing, catching) and locomotor movements around the perimeter of the grass field.

'Loose parts' school ground context. The 'loose parts' distributed across the grass field within the second equipment context, provided opportunities for the children to better use the space by repositioning equipment to different locations. The unique use of foam swimming noodles (intended as a floatation device for swimming) became an exploratory item for children's physical activities using the equipment item for practicing 'grips' and manoeuvring hands, javelin throwing, carrying or riding around the field and swinging movements against the wind.

'Traditional' school ground context. The field note observations recorded instances of the primary school children running around other children, swimming around poles, sliding and crawling around rocks, swinging and hanging for long periods on the flying fox, having pushing competitions with hands, incidental activity chasing balls off courts, running up stairs and hanging on the stair railing.

'Learning through movement' HPE curriculum sub-strand (e.g. rules, regulations, strategies, critical thinking, responsibilities)

'Empty' school ground context. Children would discuss and plan soccer rules, resolve conflict of soccer rules, problem solve around the masses of children engaging in soccer activity with a single ball, develop clear soccer roles such as a goalkeeper, defenders, attacking players and establishing boundaries for the game.

'Loose parts' school ground context. Each of the developed activity stations with the equipment would involve teams with set roles such as a leader, cleaner, builder, collector/gatherer and observer of equipment. The children within this equipment context would have to solve movement problems such as where boundaries would be placed for activities to not impede the building, construction and imaginative play activities. The team sleigh races were highly developed with an orderly line of those 'waiting', 'sleigh pushers/draggers/runners/racers', 'sleigh riders' and 'sleigh collectors'.

'Traditional' school ground context. Children would be involved in coordinated hopscotch movement challenges, running and following others across spaces. The children within this context would learn to kick off the flying fox with their feet to gain speed, flip over on the monkey bars and would conduct running races to fixed sets of equipment. Children would participate in unstructured competitions such as 'downball' (have to hit and bounce tennis ball into other squares with one hand), coordinate obstacle course runs around the fixed sets of equipment, undertake Australian rules football training for upcoming inter-school sport competition and chasing tag games in and around the fixed sets of equipment.

During the downball, football and tag game competitions there was regular discussion of team selections, use of spaces/borders for the activities and unstructured rules. Many of the children would follow leaders and learn from the rules being developed and would be happy to be part of the group. In contrast to the negotiation of types of equipment (loose parts context), the physical activity negotiations that would take place within the 'traditional' school ground equipment context included deciding which direction to run, what would be the targets for rolling hula hoops and deciding who gets to start with a ball during an activity.

Discussion

The unique contribution this study makes to the international research literature is that this is the first study to report on how primary school children's engagement with and development of HPE experiences can complement the curriculum or as a transferable setting from formal classes. The Australian HPE curriculum provides a basis so that children can experience creating, applying, practising, understanding and evaluating skills within the HPE discipline (ACARA 2014). The present study demonstrates that through the provision of loose parts and traditional school ground equipment, a variety of HPE and more complex learning experiences can be facilitated to complement the Australian curriculum compared with a school ground 'empty' of equipment. Many previous school equipment design studies have examined the influence of strategies on physical activity levels (Kriemler et al. 2011; Dobbins et al. 2013); yet, this study innovatively examined the HPE learning experiences from differing design contexts. The study also uniquely explored a primary school context in which children had almost no access to school ground equipment (just 3 plastic sandpits and a soccer ball). Introducing loose parts were found to develop children's creative, intensity of physical activity by better utilising school ground spaces. Many similar physical activities were developed within the traditional school ground context, yet not being able to relocate equipment move, develop and design activities appeared to impact children's level of physical activity engagement.

Although the 'empty' school ground context was unique to the present study and no research to our knowledge has investigated primary school children's physical activities within such a context, the present findings suggest equipment provision is vital to meet HPE curriculum objectives. Within the present study, the direct observations revealed that as there was often no clear direction to the primary school children's physical activities in the 'empty' school ground context, with the most predominantly coded activity being 'no identifiable activity'. The proportion of children coded as engaging in sedentary behaviour (sitting/standing) within the 'empty' school ground equipment context were significantly lower than the children experiencing activities with loose parts equipment. Across each of the primary school HPE curricular strands and sub-strands, many of the physical activities that were developed were less complex which included jumping on the spot, following a leader, walking around trees, simulating movements, general locomotor movements and engaging in the few equipment items available (sandpit and soccer play). The lack of engagement in a complex or diverse range of physical activities within the 'empty' school ground context could be related to the importance of providing sensory stimulation through colours, shapes, dimensions, patterns and textures for children's development (Hyndman et al. 2012). The management and design of school grounds largely determine what children will engage with during their time there (Hyndman and Chancellor 2015) and this is reflected in the present study. With the elimination of school ground spaces and facilities (Chancellor 2013), such findings are worrisome for children to optimise health, learning (Malone and Tranter 2003) and to meet HPE curricular objectives within school grounds.

The lack of engagement in physical activities and regular coding of activities that were not identifiable within the empty school ground equipment context reflects the assumption that even the most imaginative and social children will find it challenging to create and interact with school grounds that are bleak and sterile (Titman 1994). School grounds require diversity of places to be active and venues that provide the maximum opportunity to interact with peers and with activity experiences (Malone and Tranter 2003). Children are suggested to require structures, equipment and materials that can be modified, explicitly or in their imagination (Malone and Tranter 2003). A good school ground is known as a place for doing (extending themselves, finding challenges and taking risks), a place for thinking (intellectual stimulation, discover, study and learn), a place for feeling (colour, beauty and interest, a sense of ownership and belonging) and a place for being (to 'be' themselves, privacy away from required interactions with others) (Titman 1994). Furthermore, previous research examining the density of features within school grounds reveals that design features positively influence children's moderate-vigorous physical activity (MVPA) (Anthamatten

et al. 2014) and utilisation of such spaces for activities (Colabianchi, Maslow, and Swayampakala 2011). The findings from this paper reinforce the importance of the provision of engaging features to ensure that primary school children engage with their environments, undertake more intensive and complex physical activities to ensure that the school grounds can be a valuable developmental setting.

Research on school ground physical activities suggests that children use and prefer contexts with increased complexity of challenge and novelty (Hyndman, Benson, and Telford 2014). The challenge and novelty from the provision of loose parts within school grounds is one such strategy to enhance primary school children's development. Previous studies of both 5–7-year-olds (Bundy et al. 2009; Bundy et al. 2011; Engelen et al. 2013) and 5–13-year-olds (Hyndman, Benson, and Telford 2014; Hyndman et al. 2014; Hyndman and Lester 2015a) have established that the unstructured free-play benefits of loose parts can lead to a host of cognitive (creativity, resilience, problem-solving), social (teamwork, negotiation, inclusion and cooperation) and physical learning benefits (fundamental motor skills, equipment challenges). Yet, how the physical activities primary school children develop and engage in with loose parts and how these meet HPE curricular outcomes is yet to be investigated. The positive benefits of the loose parts equipment on the primary school children's imagination (most predominant activity type), creativity (high predominance) and intensity of physical activities (higher intensity activities than the other equipment contexts) are reinforced within the present study. Current research has revealed that primary school children have a high level of enjoyment for imaginative and creative activities (Hyndman and Chancellor 2015). Facilitating higher intensity physical activities also provides children with the opportunity to meet 'intensity-specific' national physical activity guidelines of one hour of MVPA (Australian Government 2014). This is important as under one in five young people are meeting the national physical activity guidelines for health (Active Healthy Kids Australia 2014).

The findings within the present study reveal that the loose parts equipment context provided innovative and diverse activities for the children to meet the HPE curricular objectives; including 'moving their body' (e.g. jumping, landing, dragging, rolling, bouncing and swinging movements) and 'understanding movement' (e.g. positioning equipment and imaginatively exploring equipment scenarios). The primary school children were also able to effectively 'communicate and interact for health and wellbeing' (e.g. working together to create, design, build, observe, recruit and negotiate), 'contribute to healthy and active communities' (e.g. sand and tree exploration) and 'learn through movement' (e.g. have set team roles and rules for imaginative and constructing operations). Such social engagement findings reflect previous research that have identified that social physical activities facilitate the highest enjoyment for primary school children (Hyndman et al. 2013; Hyndman and Chancellor 2015; Hyndman and Lester 2015b; Hyndman, Chancellor, and Lester 2015). With loose parts equipment readily accessible within the home and community, primary school teachers could encourage children to continue HPE developmental activities at home to enhance the transfer of physical activity behaviour from school. Insight into the potential of unstructured, free-play for school children's development via loose parts equipment continues to emerge and is becoming a vital fixture within school grounds as an option for those that have less preference for structured sporting activities (e.g. soccer). Further investigation is therefore warranted into how the provision of loose parts equipment can meet curricular objectives across other and multiple disciplinary areas.

Research indicates that traditional school ground contexts, as reflected within the present study, have limitations for engaging children not interested or physically able to participate in the more structured activities (e.g. set time, location, purpose) (Dyment and Bell 2007). Although recent research has pointed to the limited activity options provided by traditional school ground equipment (Dyment and Bell 2007; Dyment, Bell, and Lucas 2009), the present study demonstrates that primary school children were often engaged in similar developmental activities as to those within the loose parts context. For instance, primary school children within the loose parts context would plan, and design activity stations with the loose parts equipment, yet within the traditional context, the children would be plan monkey bar sequences or which sections of the school grounds to explore.

Other similarities included jumping over, across and on to objects (platforms and seats = traditional context; hay bales and crates = loose parts context), following the leader and instructing others on skill sequences. Despite such similarities and notable contributions recorded to complement the HPE curriculum, the average physical activity intensity proportions of the primary school children within the traditional context were significantly lower than children who were experiencing loose parts equipment. Children within the traditional context were engaged in significantly higher average proportions across the five days of sedentary behaviour (sitting/standing) and significantly less in higher intensity activity (important to meet national health objectives). Such findings are alarming, as the physical activity proportions within the traditional context were similar to those children who had no access to equipment (other than sandpits and a soccer ball). The findings can be attributed to less use of space from the set equipment locations of the traditional context, less variety and quantities in equipment available to the children to fully engage in diverse physical activities. With both loose parts and traditional equipment contexts addressing many HPE curricular strands, it could be a worthy consideration for schools and researchers to combine the use of both equipment scenarios for children's development. There is also scope to explore other equipment contexts including the prevalence of greening (trees, rocks and gardens), fitness-focused recess periods, surface markings and recess activity facilitation on HPE curricular outcomes (Hyndman 2015).

Components of a number of student-centred pedagogical goals were observed within the present study, especially with the loose parts equipment such as problem-solving activities and cooperative learning (different activity roles in teams). This suggests that a range of pedagogical strategies can be considered within school grounds to develop children's learning of the HPE curriculum. Within the Australian HPE curriculum, insight into skills to work through tactical and technical game situations (e.g. striking, net/wall, target, invasion games) have been encouraged via the Game Sense pedagogical approach to learning for decades (Pill 2011). Within a Game Sense pedagogical approach, HPE pupils are provided with guided questions to promote game situations and understanding for movement solutions (Pill 2011). It is possible that children could be trained to work together to question and reflect on tactical game situations within school grounds, especially if there are children involved in competitive sport to mentor other students. Within the present study, HPE curricular aspects such as undertaking roles, following rules and instructing peers on skills were evident and could be expanded upon. Sport education pedagogical models could also be facilitated by HPE teachers (Perlman 2011) so that the rules, roles and regulations of chosen sports such as soccer and cricket are followed more closely and understood by children when having access to school grounds. The facilitation of pedagogical strategies within school grounds is an area warranting investigation.

It is important that primary school teachers are aware of all influences on children's HPE development, as there is an environmental disconnect between primary and secondary school which can contribute to a decline in in physical activity levels when children reach secondary school (Dollman, Norton, and Norton 2005; Pate et al. 2007; Hyndman et al. 2012). The lack of connection from primary to secondary school of physical activity participation (Haug, Torsheim, and Samdal 2008) could be counteracted if teachers are aware of how to develop key HPE curricular skills and learning habits within school grounds. As the direct observation data were collected during school lunchtime recess, the findings may not be reflective of physical activities during morning and afternoon school recess or after school within each school ground equipment context. It is possible that the introduction of seven weeks of loose parts equipment could have resulted in novelty effects, yet the primary aim of the present study was to gauge how activities within different school ground equipment contexts can complement the Australian primary school HPE curricular strands. As the study was conducted within two Australian primary schools, caution should be undertaken when generalising findings. Due to both primary schools implementing 'no hat, no play' sun safety policies, gender-based observations were unable to be recorded. School grounds are the stage where children can act out, without restraint, yet the outside environment and the learner has not been prioritised as a key developmental setting (Malone and Tranter 2003). School grounds have often been viewed as

places for play and sport, and not for educational endeavours; therefore, the present study provides scope to reconsider viewpoints of school grounds as an important 'hidden' or the 'informal' HPE curriculum.

Conclusion

The findings from the study suggest that the provision of a variety of school ground equipment are important for children to undertake more complex physical activities and meet HPE curricular objectives. Primary school children who had no access to equipment had restricted engagement in developmental HPE activities to meet key HPE curricular objectives. Introducing loose parts was found to develop children's creative, intensity of physical activity by better utilising school ground spaces. Although many similar physical activities to the loose parts context were developed within the traditional school ground context, not being able to relocate equipment, move, develop and design activities appeared to negatively impact children's level of physical activity engagement. The researchers conclude that combining and implementing a range of equipment ideas into school grounds stands to ensure that primary school children meet Australian primary school HPE curricular objectives. The findings from this paper can be used by teachers to ensure that engaging equipment features are provided to ensure that primary school children connect with their environments, peers and themselves to undertake more intensive and complex physical activities. Such findings can be used by schools to ensure that school grounds can be optimised as an informal and complementary primary school HPE curricular setting.

Disclosure statement

No potential conflict of interest was reported by the authors.

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